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mentary, outlines. The most recent authorities on the subject are General Cunningham's valuable monograph on Ladakh, Captain Montgomerie's Memoir in the Bengal Asiatic Journal of 1861, and a series of full and very interesting papers on Kafiristan and Chitral, compiled from special native researches by Captain Raverty, and published in the same periodical. In the presence of the mass of information contained in these papers, it is impossible to consider these countries as any longer open to free unlimited speculation.

Similarly, Sir Henry is considered to show remissness in not having at once detected the identity, actual or possible, of the Baron's *Dshashgur Gobi* with the Dard tribes, Strabo's Daradæ and the Daradas of the ancient Indians. The Baron's people, however, are speakers of Bili, which is Little Tibetan, according to M. Khanikof's hypothesis. If such be the case, how can they be Dard at the same time? But they are called upon to be three different things at once, as though two were not enough; for they call God Imra, which is taken elsewhere to prove that they are Kafirs of Kafiristan. Now, clearly, we cannot accept the vindication of any single assertion of the Baron's, made by picturing its component details out of three or four distinct and discrepant quarters at once, and then combining them wherever anything superficially favourable can be pressed into the service, as any substantiation whatever of his authenticity. Yet it is in this very same manner that M. Khanikof appeals to Wyld's map in support of the name of the Baron's alleged volcano, and to a passage in Moorcroft in support of its volcanic character. But the former is s.w. of Sirinagur, and the latter refers to a hill overhanging the Wulur lake, on the north-western road. It is clear that the Baron's volcano cannot be both at once. Nor, for that matter, do the statements coincide in other respects. The Baron is told that smoke and stones are almost always seen issuing from his hill. Moorcroft is told that unaccountable explosions are heard at intervals from his hill, without a word about smoke or stones. Their two reports, each resting on hearsay, do not lie parallel to each other; one treats of a thing always visible, the other of something now and then audible, with nothing visible to account for it.

With the authenticity of the Baron's travels north of Pamir, in Turkistan, we have no occasion to occupy ourselves. The apparent authenticity of his statements when in that region, vouched for by the Russians, who now have the means of obtaining the best possible information on the subject, as well as by the manifest correctness of his local and proper names when in the Turkish countries, undoubtedly serves to complicate the case as regards the Baron personally, but that is no concern of ours. Had we no knowledge of the country south of Pamir, his ascertained accuracy, when on ground north of it, might have been admitted as a plea *à priori* in favour of his absolute authenticity there and everywhere. But this cannot invalidate arguments based on positive data. Yet with the exception of this one general argument, of which the special application is inadmissible, no substantial reason in favour of the Baron has been adduced; nor has any ground been taken up in M. Khanikof's vindication of the earlier part of the Baron's travels, which seems to be tenable for one moment.

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2. *Recent Volcanic Eruption at Santorin.*

[The two following papers may serve as a continuation and completion of the history of the recent volcanic outbreak, the early events of which were described in the account written by Dr. Schmidt, and published in the present volume of the 'Proceedings,' p. 118.]

(*a*). *Visit of H.M.S. 'Racer' to Santorin.* By Commander LINDESAY BRINE, R.N., F.R.G.S.

"The *Racer* left Athens on the 26th February, and at daybreak on the 27th, after passing Milo, the heavy white clouds sweeping over Santorin were reported in sight. As we neared the island the sea became of an unusually light green colour, the same tint as generally denotes shoal water. This colour was so peculiarly light and muddy that we stopped and sounded, but found no reason to suppose there was any change in the depth given in the chart.

"On entering the Bay we passed to leeward of the Kaimenes, and the light northerly wind then blowing swept clouds of light vapour amongst the rigging and mastheads, the air too was warm and oppressive and strongly impregnated with sulphur. The water in many places was greatly discoloured, but it was observable that this discoloration was never in patches but always in well defined streaks, about 50 yards wide and from 2 to 3 miles long. In the afternoon, after having communicated with the authorities at Thera, we proceeded to our anchorage on the 7-fathom shoal, about half a mile from the volcano.

"Upon examining the extent and nature of the volcano at Neo Kaimene, and also the lately formed island Aphroessa (so called after the name of the Greek gun-vessel), we found that the former consisted of an irregular mass of clinker, scoriæ, pumice, and more or less burnt basaltic lava, raised from 70 to 130 feet above the sea. It had completely filled up Volcano Bay, and occupied the space included within a straight line drawn from Point Phlego to Point Megalo, on the south side of Neo Kaimene.

"Aphroessa had attained to a height of 30 feet, upon a circular base of 300 yards, and consisted of a loose heap of clinker, and some burnt lava through whose crevices could be seen the deep red glow of the burning rocks inside the cone.

"During the day the quantities of steam that escaped, and the loudness of the subterranean noises gradually increased, but unattended with any explosion. At 6·30 P.M., 8·0, 9·0, and 10·30, there were slight eruptions, and at 11·30, there was a loud sharp report followed by three rapidly successive columns of dark smoke or steam and dust—with these columns were mixed volcanic stones, which were thrown to a height of 150 to 200 feet. After this the crater was quiet, but the volcanic action within became tremendous; the cone and adjoining ridges were pressed upwards, about 30 feet above their usual height, and a crashing noise, like heavy waves advancing and receding upon loose shingle, became constant. Steam escaped from hundreds of openings, at first with the noise of steam-whistles, and then as if the valves had been lifted it burst out with the roar of thousands of vessels blowing off steam, the cone and the crater at the same time visibly swelling. At 1·40 A.M. occurred a slight eruption, followed by a comparative silence, the ridges still rising and assuming a rounded form. At 24 minutes past 2 an immense column of flame rose quickly from the crater, this was immediately succeeded by dense volumes of dark smoke, and then at 27 minutes past 2 there was a tremendous explosion; the cone was entirely shattered, and masses of burning rock were shot upwards to a height of more than 500 feet, and outwards to a radius of half a mile. Mikro and Neo Kaimene were literally covered with bright white-hot and red-hot stones, and for several minutes their slopes were brilliantly illuminated; as the stones grew cool their brilliancy faded, but it was fully three-quarters of an hour before their glow finally disappeared.

"I subsequently examined several of the rocks that had fallen from this eruption on Mikro Kaimene, at a distance of about 600 yards from the crater, and found them to consist of the usual hard, black, partly burnt lava, all of considerable size, and many of them measuring quite 30 cubic feet. Some of the heaviest blocks—those that were the least burnt—I estimated to weigh from 25 to 35 cwt., others had but little more specific gravity than an equal mass of cinder.

"The concussion caused by the eruption was very great—it shook the ship violently, and awoke all the men sleeping in their hammocks below—the temperature of the air at the anchorage was also sensibly increased.

"After this great effort the volcano resumed its ordinary action, the crashing noise being still incessant but less loud—there were also slight eruptions of scoriæ and ashes, which were entered in the logbook as occurring at 2·50, 3·10, and 3·15. Others also followed at variable intervals during the day.

"On the morning of the 28th, I took a cutter and the dingy, and accompanied by Mr. Spry the master, Dr. Bromlow, and Mr. Reddie (midshipman), proceeded to examine Aphroessa, and the sea and shore around Neo Kaimene. We pulled through the passage inside Mikro Kaimene, and then skirted the sides of Neo Kaimene, sounding at intervals and testing the temperature of the water. There was no change in the passage, nor on the north side of Neo Kaimene; but on approaching St. Giorgio Bay on the south-west side we found the sea much agitated, and of a light milky blue colour. On pulling to the head of the bay close to the shore we saw numerous sulphur-springs, the temperature of the sea about them varying from 130° to 142° Fahr. The smell of sulphuretted hydrogen here became unbearable, and the bottoms of the boats and blades of the oars which were painted white were turned dark-brown.

"Upon landing we found the shore covered with fragments from the late eruption, many of them being still too hot to touch with the hand.

"Leaving St. Giorgio Bay we pulled slowly to Aphroessa, and then across to Paleo Kaimene. Between the bay and Aphroessa, the water was covered with bubbles, and became almost grey white in colour, and close to the island its temperature was 122° Fahr. The wind being fresh from the northward the sulphur steam and flame were blown clear away to the south, and thus I was able to place a boat close alongside to windward without incurring much danger. The growth of Aphroessa had been rapid. At a point where the Admiralty Charts marked 70 fathoms, there were found on the 11th February only 12 fathoms. On the 14th the island appeared, and on the 28th it had become a cone fully 300 yards in circumference at the sea-level, and 30 feet high. We laid on our oars and watched its progress with great interest.

"The pressure from the steam beneath acted almost imperceptibly both upwards and outwards. At the water's edge large blocks of hissing and burning lava and clinker slowly made their appearance—steam escaping from them at every pore. With an iron boat-hook we broke off several pieces as they rose above the sea, specimens of which I subsequently sent to Sir Roderick Murchison.

"It was impossible to calculate correctly what daily addition was thus made to the base of the island; but, judging from what I saw appear in an hour, it might be roughly estimated at 120 feet. The cone was pressed upwards very slowly, but the volcanic action within was intense. There was no roar, as with its neighbour at Neo Kaimene, but there was a constant working noise—sounds of stones crumbling and falling, accompanied with sudden sharp cracks and reports like the independent firing of musketry. Up to this time there had not been any eruption, but through the fissures in the cone it could be seen that the crater or inner rocks were red-hot, and from every possible rent or opening escaped clouds of steam and sulphurous vapour.

"We now took the boats in a straight line across to Paleo Kaimene, to see if there were any changes in the depth of water away from the immediate neighbourhood of the volcanoes. We found no change whatever. There were also no signs of volcanic action at Paleo Kaimene, and the soundings at its little anchorage were unaltered.

"Returning on the same line we found that at 100 yards from Aphroessa there were only 12 fathoms of water instead of 90, and that within 50 yards the depth was only 7 fathoms. The arming of the lead brought up in both cases volcanic dust and small fragments of ash and clinker.

" It was now past noon, and the boats' crews had to get their dinners, so we proceeded by the shortest way to the ship, going to leeward of the volcanoes, and were consequently enveloped in a suffocating atmosphere of hot air, sulphur, and dust.

" In the afternoon, as the volcano seemed to promise no second such eruption as had happened in the morning, I thought there would be no great risk in ascending the old cone of Neo Kaimene, so that from the top I could look down upon the crater and see clearly into its operations. In this expedition I was accompanied by Lieutenants Palliser and Darwall. The old zigzag path had become obliterated, and we had to clamber straight up the crumbling slopes, a struggle strongly recalling the last hundred yards in the ascent of Vesuvius. Upon reaching the summit we found that the old crater was sensibly sympathising with the new one; great chasms were forming, and the lips or edges had split in several places, the ground was also quite hot. Crossing over to the southern slope, I sat down by the edge of the cone at a spot about 350 feet above the sea, and from which I could command a complete view of the scene of volcanic action, and at the same time the eye could embrace all the southern portion of Santorin, and the sea and distant mountains of Candia.

" Two hundred feet below was an irregular mass of volcanic rocks. The volcano consisted of a quadrangular plateau, about three-quarters of a mile long from east to west, and half a mile from north to south, the surface being covered with large blocks of basalt, burnt lava, and clinker, lying loosely together, the spaces being filled with pumice and ashes. Near the south-east angle of the plateau over the space previously occupied by Vulcan's Bay rose a circular heap of rocks in the shape of a cone, about 60 feet in perpendicular height upon a base about 400 yards round. There was no hollow at the top, the cone being closed by rocks resting upon each other. There were, however, large gaps through which was seen the deep red glow within—the same glow was also visible through the apertures near the base, and occasionally, as the cone heaved and swayed, the near rocks on the plateau moved and discharged burning rocks underlying them.

" The struggle between the opposing forces of steam and weight was very wonderful. As the masses composing the cone became compact and settled in their places, so, proportionally, did the striving of the steam to escape become violent. At first there was a continuous roar like the receding and advancing noise of a heavy surf rolling upon a shingle beach. This sound would slowly change into that of steam blowing off through vast numbers of steam-pipes, then this subsided into the singing noise commonly made by an ordinary tea-kettle on the hearth, shortly before the water boils. Then the shrieking sound of locomotive steam-whistles, and then a silent pause, during which the whole cone swayed with a slow undulating motion to the right and to the left, swelling to nearly double its usual size and height, and throwing out ridges like mountain spurs. At last a broad chasm would appear across the top of the cone, and, with a tremendous roar, tons of rock and ash mixed with smoke and steam would shoot up from the crater to a height of from 50 to 100 feet. This effort over, the ridges slowly subsided, the cone lowered and closed in—and then for a few minutes would follow a comparative silence, after which the struggle would begin again with precisely similar sounds, action, and result. Immediately before an eruption all the adjacent plateau, and even the conical hill upon which I was sitting, shared in the agitation—a slight wavy motion was everywhere apparent, and steam escaped in all directions; especially was this noticeable upon the edges and sea-faces of the plateau, where volumes of steam found their way out with considerable violence, and were swept away in heavy clouds over the bay.

"High up on the slopes of the old crater of Neo Kaimene, threads of vapour also found a way to escape, thus proving a subterranean connection between the new and old volcanoes.

"It was a fine clear afternoon; and, being placed above the reach of the scoriæ thrown out by the eruptions, I could watch with perfect ease and security all the phenomena in progress below. It was interesting to observe how simple and elementary were the forces engaged—forces at work every day in the common boiler or cottage tea-kettle. Steam struggling to find a vent, and when pent in beyond endurance lifting up its weighty cover, and with a wild rush escaping into the open air.

"It was observable that throughout this agitation the fire within never appeared to get more intense, but that the usual red glow remained unchanged, the process of burning the hard black lava in clinker and ash was clearly visible, and I also noticed that after each upheaval of the cone, the outer edges of the stones composing the newly formed ridges were burnt almost to cinder.

"So undulating was the movement of the cone when being pressed upwards that it was impossible to ascertain the absolute change in progress at any one moment, the eye could only detect the increase in size by those mere optical evidences of the cone and its ridges occupying more space. The motion was, in fact, curiously similar to that of a large wave when approaching land. There was the same undulation, the same almost imperceptible increase, and then a similar waver and subsidence.

"This variation in the size of the volcano prior or subsequent to an eruption is probably the reason of the different estimates given by the observers who have calculated its height above the sea.

"Before the formation of the new volcano, there existed at the foot of Neo Kaimene, at the south part of the passage between it and Mikro Kaimene, a flourishing little bathing village, and also a low broad quay, alongside which the schooners could lay and embark pozzolana or discharge their cargoes. All this has been destroyed by the eruption and by the depression of the shore. We found that the quay and bathing-houses had sunk about 3 feet, and that the Greek chapel and houses at the back had been crushed by enormous blocks of hard black lava. The ruin was complete, there was not a single house left standing. There was a fragment of lava lying inside the chapel, having come through the roof, that must have weighed quite two tons, and the distance from the crater was not less than 400 yards—a proof of the greatness of the force exerted by the volcano.

"Before returning to the ship, we explored Mikro Kaimene, principally with the object of looking at its crater, and also to ascertain if there was any fresh water on the island. I knew that the existence of the latter was improbable; but it happened that an old grey horse had been seen straying about, and so there were some doubts upon the subject. However the search was unavailing, and no water was found.

"The slopes of Mikro Kaimene were covered with little red and blue wild flowers, and between the rocks were here and there a few wild fig-trees, of a species that strangely enough finds root and sustenance upon the barren sides of extinct volcanoes—one of these I saw near the top of the old cone at Neo Kaimene, its roots clinging to a confused heap of lava and ashes.

"On the ascent we passed the remains of an unfortunate mule that had been killed by the eruption—hot lava had fallen upon him, and had burnt away his legs and neck.

"We found the crater of Mikro Kaimene to be a bowl about 150 feet deep, and nearly half a mile round, the inner slopes as well as the outer being covered with rocks thrown from its neighbour. The entire extent of Mikro Kaimene is only five-sixths of a mile round, and therefore it may be considered simply as a small cone containing the usual hollow crater. It being of older formation than Neo Kaimene, its slopes are less barren. Its height above the sea is about 200 feet.

"It was now getting dark, and the service upon which the *Racer* had been sent having been completed, I weighed and proceeded to the south *en route* for Candia. The wind being from the north-west, we again sailed out to leeward of the burning volcanoes, and it being night we witnessed in their full grandeur all the marvellous effects that accompanied their growth. Again the air was hot and full of sulphur, and our sails and deck were illuminated by the red glare from Neo Kaimene; and as we passed Aphroessa the sea round that burning island was covered with green, red, and yellow flames, shooting up like torches, or playing like serpents upon the face of the water. During the night, long after we had left the bay, the reflexion of the flames could be seen high in the sky, and in the morning, although nearing the snowy mountains of Candia, there were clearly visible in the northern horizon the heavy white clouds which hung like a pall over Santorin.

"I have since received news from Santorin dated the 21st March. The people were regaining confidence, and were getting accustomed to their noisy neighbours. The volcanoes were still active, and both were slowly increasing; but the eruptions were slight and unfrequent, and the whole volcanic action was becoming less intense.

"The only danger now dreaded is from earthquakes. During the first week in February, the volcanic chain to which the island belongs was visited by an undulating wave which was felt at Patras, Tripolitza, Nauplia, and Chios, but as yet Santorin has been spared. The system of building the towns upon the edge and face of the cliffs renders Santorin especially liable to danger from earthquakes, as the slightest shock would suffice to detach masses of the pozzolana and pumice, of which the cliffs are composed, and send them and the houses upon them down to the sea, 900 feet below. Part of the town of Merivouli and the houses on Point Skaro were destroyed by the earthquakes which accompanied the formation of Neo Kaimene, in 1707, and within the past ten years a landslip swept away several of the houses at Thera, the capital town of the island."

Since the receipt of the above communication, Commander Brine has written to Mr. Bates, the Assistant-Secretary, as follows:—

"August 7th, 1866.

"I have just received the last report of Dr. Décigala upon Santorin. It appears that the volcanic action is becoming less intense, but the steady and gradual elevation of the bottom between the islands Neo and Paleo Kaimene continues. Aphroessa has become joined to the main island, Neo Kaimene, and is in size nearly as large as the first formed volcano, called Georges. The eruptions have been rare and very slight, and since the 15th of June Aphroessa has ceased to show any flame. The most remarkable phenomena now occurring are the formation of small islets near the volcano, and the elevation of the land between Neo and Paleo Kaimene. It has been found by soundings that in some places the bottom has risen six fathoms in twenty-one days.

"Last May the *Gibraltar* visited Santorin, and this part of the bay was carefully surveyed. A copy of this survey was kindly sent to me by Captain Coote, one of our Fellows, and I forward it to you* that it may be seen at a glance the changes that are taking place—the deepest water *now* found between Paleo and Neo Kaimene is 40 fathoms."

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* The chart alluded to is deposited in the Map-room Collection.